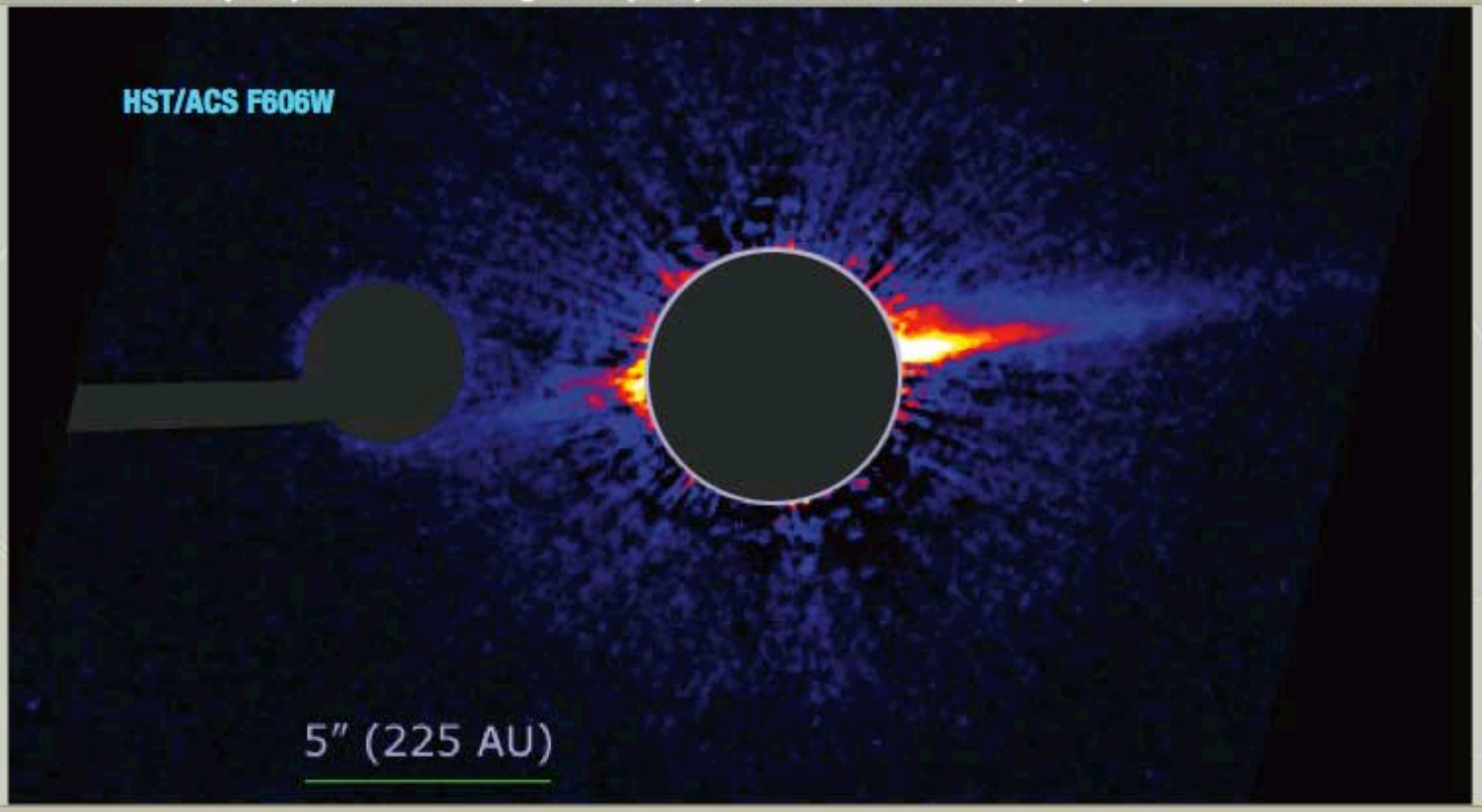
THE BLUE NEEDLE

A highly asymmetric debris disk surrounding HD 15115

Paul Kalas (UCB) | Michael Fitzgerald (UCB) | James R. Graham (UCB)

2007 ApJ, 661, L85



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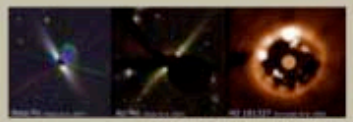
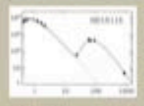




Three disks imaged in scattered light (above) are members of the Beta Pic Moving Group. HD 15115 was found to have IRAS excess by Silverstone (2000). New sub-mm data (left) give a dust mass of 0.045 Earth mass located ~35 AU radius from the star (Williams & Andrews 2006).

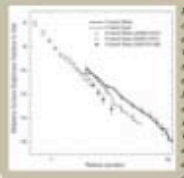
- HD 15115 is an F2 star at 45 pc with significant far

HST Observations

Surface brightness uncertainties for the HD 15115 disk. The left edge of the frame begins at 2″ radius. The innermost contour (bold) is 19.0 mag arcsec^{-2} and the outermost contour is 23.0 mag arcsec^{-2}, with 0.5 mag arcsec^{-2} contour interval. The gray region marks the area occupied by the ACS/HRC occulting finger and 1.0″ diameter occulting spot.

- HD 15115 observed on July 17, 2006, using the ACS/HRC coronagraph and 1.8 arcsec occulting spot (above).

Keck Observations



Radial surface brightness (mag arcsec^{-2}) distribution along the west and east midplanes of HD 15115. We plot the difference between the measured disk surface brightness and the stellar magnitudes of M_V=3.86 and V=6.80. Disk photometry was extracted from boxes 0.25″ x 0.25″ centered on the midplane. We plot a representative sample of error bars that gives the standard deviation of the background residuals as a function of radius.

- We confirmed the HD 15115 disk using Keck adaptive optics on October 7, 2006, and January 26, 2007, in J, H and K. The

The origin of needle disks

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Here we show a dynamical simulation from Larwood & Kalas (2001). A near coplanar flyby disrupts the disk and the perturber captures material, forming a highly asymmetric tail. Note that another BPMG member, HIP 12545 (Song et al. 2003), is located 3.9 pc southeast of HD 15115.

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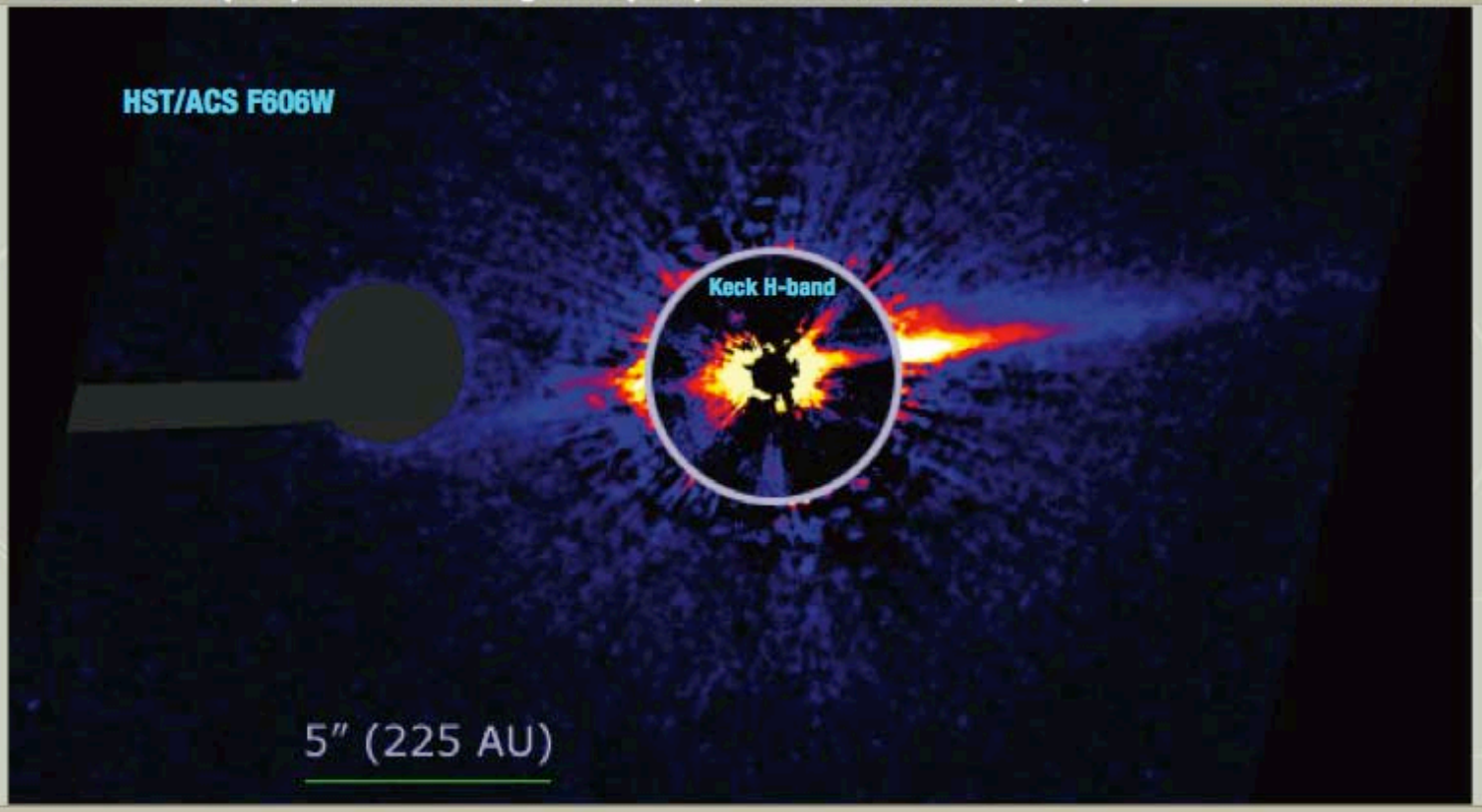

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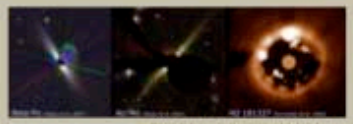

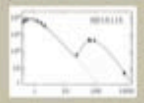

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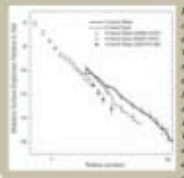

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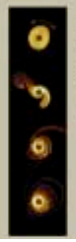

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